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ARTICLE

Gender differences in psychotropic medicine dispensing at a pharmacy in Melbourne, Australia, 1954 and 1961

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Abstract

An examination of psychotropic dispensing by gender in historic prescription books could help trace the origins of psychopharmacology in Australia. This study examined gender differences in psychotropic medicine dispensing at a Melbourne pharmacy during the 1950s and 1960s. Data were sourced from two prescription books. Numbers of prescriptions dispensed in 1954 and 1961 were calculated for each gender and adjusted for population size. More prescriptions were dispensed for females than for males, by factors of 2 and 1.7 to 1 in 1954 and 1961, respectively. This differential persisted across prescription type (barbiturate psychotropic, non-barbiturate psychotropic, and non-psychotropic). Psychotropic dispensing shifted from barbiturates (77% in 1954; 38% in 1961) to newer, safer non-barbiturates (23% in 1954; 62% in 1961), irrespective of gender.

Introduction

Prior to the 1950s, there were few effective, safe, and humane options for the management of mental health disorders. People with mental health disorders were managed to a small extent in the community and to a large extent in purpose-built asylums, through methods such as electroconvulsive therapy and physical restraint or through any of a small number of psychotropic drugs.[1,2] Drugs in the barbiturate class were among the most commonly used prescription psychotropic medicines in the first half of the twentieth century.[3] This drug class takes its name from the first barbiturate barbituric acid, which was discovered and named by German chemist Johann Adolf von Baeyer on 4 December 1863 – the feast day of St. Barbara.[4]

Barbiturate use became commonplace in Western society following the marketing of barbitone (brand name Veronal) in 1903.[5] While barbiturates have proven effective at inducing sleep, they have also been shown to cause a range of adverse effects such as unwanted daytime sedation, comas, and deaths, including the deaths of actresses Marilyn Monroe in 1962 and Judy Garland in 1969.[6] Such a high potential for harm relates to the fact that barbiturates have narrow therapeutic indices; there is little difference between the dose required to effectively sedate a patient and the lethal dose.[7] This reflects the need in the first half of the twentieth century for safer alternatives to existing psychotropic drugs.

During the 1950s, an event referred to as the 'Psychopharmacological Revolution' forever changed the face of psychiatric practice.[8] In December 1950, French chemist Paul Charpentier synthesised a medicinal substance called chlorpromazine.[9] Over the next two years, this drug was trialled and found to relieve psychotic agitation, especially manic excitation.[10] Chlorpromazine was first marketed in December 1952 for the treatment of psychiatric disorders and other indications, including morning sickness.[11] The drug was, and still is, marketed in Europe and Australia under the brand name 'Largactil'. It soon became possible for people suffering from psychiatric disorders to be successfully managed with chlorpromazine in the community rather than being institutionalised.[12] Chlorpromazine became the world's first antipsychotic drug. The success of chlorpromazine in psychiatry gave birth to the field of psychopharmacology and prompted the search for other targeted psychotropic drugs, with further antipsychotics and drugs such as tricyclic antidepressants and benzodiazepines becoming available in the 1950s and 1960s.[13] Many of these newly available non-barbiturate psychotropic medicines had superior safety profiles to the earlier barbiturate drugs. This was a time of rapid change in the practice of psychiatry and pharmacy.

Gender is an example of a demographic factor that could have influenced the uptake of new psychotropic medicines over the 1950s and 1960s. Compared with men, women may be less reluctant to seek medical attention and more sensitive to market changes.[14] In a prior study of prescription books kept in an English community pharmacy over the period 1890-1922, the drugs of dependence opium, cocaine, and heroin (legal substances at the time) were more likely to be dispensed to females than to males.[15] These results were not, however, adjusted for the sizes of the male and female populations in the surrounding geographic area. Many of the male users of drugs of dependence in this historical study were returned servicemen who served in such countries as South Africa and India.[16]

While this study shed some light on gender differences in the utilisation of drugs of dependence between the 1890s and 1920s, no known studies have examined gender differences in psychotropic use within a community pharmacy setting during the 1950s and 1960s – the period of the Psychopharmacological Revolution. Women may have been more likely than men to seek newly available treatments for mental health disorders, whereas returned servicemen with conditions such as

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posttraumatic stress disorder may have also been regular users of psychotropics at this time. Such information is of interest in that it lays the foundation for the high levels of psychotropic use in modern day Australia. Modern day Australia has been found to have the second highest consumption of antidepressants in the world,[17] with women being significantly more likely than men to use these medicines.[18] An examination of psychotropic dispensing by gender in historic prescription books could help trace the origins of psychopharmacology in Australia.

This study aimed to examine gender differences in psychotropic medicine dispensing at an Inner South East Melbourne pharmacy during the Psychopharmacological Revolution of the 1950s and 1960s.

Methods

Data Source

Prescription books can be considered rich yet underutilised sources of primary historical data on medicine dispensing.[19] Prior to the availability of dispensing software, prescription books were used to record all prescribed medicines supplied to customers. Previously, prescription books dating from the 1850s,[20] 1860s,[21] 1900s,[22] and 1960s[23] have been used to broadly describe the medicines dispensed in individual Australian pharmacies. In the United Kingdom, meanwhile, prescription books dating back to the nineteenth and twentieth centuries have been examined to better understand temporal changes in the use of different dosage forms as well as the dispensing of drugs of dependence.[24, 25, 26, 27, 28]

The data source for the present study is a pair of mid-twentieth-century prescription books that were kept at a community pharmacy in an inner south east suburb of Melbourne, Australia (Figure 1). Each book is bound in leather and measures 41 x 18.7 x 9.7 centimetres. The elder of the two books details prescription medicines dispensed over the period 25 November 1953 to 1 June 1956, while the more recent book covers the period 20 May 1960 to 24 July 1963. Both volumes contain handwritten information on prescriptions dispensed by several pharmacists, or pharmaceutical chemists as they were known at the time. The handwritten information includes patients' titles, patients' names, dispensing dates, medicines dispensed, costs, and directions for use. The pharmaceutical chemists wrote this information in ink on ruled pages, using the conventional academic language of Latin. The dispensed prescriptions appear in each book in chronological order.

Figure 1. *The prescription books used to source primary data*

Study Design and Data Collection

A descriptive study was conducted to examine the volume of medicine dispensing over the calendar years 1954 (book 1) and 1961 (book 2) by gender, prescription type, and year. These years were chosen to examine changes in psychotropic drug utilisation over a period coinciding with the rapid introduction of new psychotropics (antipsychotics, benzodiazepines, and antidepressants) into the Australian market during the 1950s and 1960s. For each prescription recorded in the two books over the years 1954 and 1961, the following data items were collected: dispensing date, patient title, and name of medicine dispensed. The title of patients (e.g. Mr, Mrs, Sir, and Lady) was used as a marker of gender. Among all medicines dispensed, barbiturate psychotropics, non-barbiturate psychotropics, and non-psychotropic medicines were identified using a published list of psychotropics in common use in 1959[29] as well as the editions of the *British Pharmacopoeia*[30, 31] and *Martindale: The Extra Pharmacopoeia*[32, 33] that were current at the time.

Inclusion and Exclusion Criteria

For each prescription, the inclusion criterion was medicine supply during the calendar years 1954 or 1961 while the exclusion criteria were unknown gender (no title), a cancelled prescription, a prescription intended for veterinary use, and handwriting that could not be deciphered by a pharmacoepidemiologist with experience in community pharmacy.

Data Analysis

A descriptive analysis of eligible prescriptions was conducted. Firstly, raw numbers of prescriptions dispensed in 1954 and 1961 were calculated and stratified by prescription type (barbiturate psychotropic, non-barbiturate psychotropic, or non-psychotropic medicine), year of dispensing, and gender of the patient. The raw numbers were then adjusted for the size of the male and female populations resident in the local government area

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(LGA) City of Stonnington – where the pharmacy was located – using Australian census data for the years 1954[34] and 1961.[35] What is now Stonnington comprised the cities of Malvern and Prahran during the study period.

For each of the years 1954 and 1961, the ratio of prescriptions dispensed for females to prescriptions dispensed for males was calculated across all prescriptions and for each prescription type. Additionally, for each year and gender, calculations were performed to determine the percentages of all prescriptions that were non-psychotropics, barbiturate psychotropics, and non-barbiturate psychotropics, as well as the percentages of psychotropics that were barbiturates and non-barbiturates. All calculations were performed in SPSS Version 24 (SPSS Inc., Chicago, IL, USA) or Microsoft Excel 2010 (Microsoft Corporation, Redmond, WA, USA).

Ethical Considerations

Ethics approval to conduct this research was obtained from the Monash University Human Research Ethics Committee, project 9523, approved 11 July 2017.

Results

Between 2/1/1954 and 31/12/1954, 3,616 prescriptions were recorded in the elder of the two Melbourne pharmacy ledgers. A total of 1,127 prescription records were excluded from the 1954 sample for a range of reasons, most commonly cancellation (Table 1). This left 2,489 prescriptions in the final 1954 sample for descriptive analysis. In the later period, between 3/1/1961 and 29/12/1961, 2,783 prescriptions were recorded in the second Melbourne pharmacy ledger. A total of 1,317 prescription records were excluded from the 1961 sample, primarily due to cancellation (Table 1), leaving 1,466 prescriptions for the descriptive analysis. Between 1954 and 1961, the number of prescriptions filled at the Melbourne pharmacy fell by 41% from 2,489 to 1,466.

Table 1. *Reasons for excluding prescriptions from the 1954 and 1961 samples*

	No. of excluded Prescriptions (%)			
Reason for exclusion	**1954**		**1961**	
Cancellation	826	(73.3)	950	(72.1)
Indecipherable	135	(12.0)	134	(10.2)
Veterinary use	92	(8.2)	122	(9.3)
Unknown gender (no title)	47	(4.2)	23	(1.7)
Cancellation and veterinary use	27	(2.4)	86	(6.5)
Indecipherable and veterinary use	0	(0.0)	2	(0.2)
Total	1,127	(100.0)	1,317	(100.0)

Table 2. *Unadjusted and adjusted number of prescriptions dispensed in a Melbourne pharmacy, by prescription type, year, and gender*

	Males		**Females**		**Total**	
	1954	**1961**	**1954**	**1961**	**1954**	**1961**
Number of prescriptions (unadjusted for population size)						
Barbiturate psychotropics	131	35	349	83	480	118
Non-barbiturate psychotropics	43	65	102	123	145	188
Non-psychotropics	566	396	1,298	764	1,864	1,160
Total	740	496	1,749	970	2,489	1,466
Total Local Government Area population[36,37]	45,568	46,016	55,351	54,408	100,919	100,424
Population size ratios (reference category: 1954 Males)	1.000	1.010	1.215	1.194		
Number of prescriptions (adjusted for population size)						
Barbiturate psychotropics	131	35	287	70	418	104
Non-barbiturate psychotropics	43	64	84	103	127	167
Non-psychotropics	566	392	1,069	640	1,635	1,032
Total	740	491	1,440	812	2,180	1,304

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When prescriptions in each year were stratified by gender and prescription type, higher raw numbers of barbiturate psychotropic, non-barbiturate psychotropic, and non-psychotropic drugs were observed among females than males across both time periods (Table 2). There was no evidence of any seasonal trend in psychotropic dispensing for males, females, or persons over each of the years 1954 and 1961 (data not shown). As there were approximately 20% more females than males in the LGA City of Stonnington, adjustment of the prescription numbers for population size led to a less pronounced gender difference in prescription volumes. Females were dispensed more prescriptions in total, by a factor of 2 to 1 in 1954 and 1.7 to 1 in 1961 (Figure 2). This differential was maintained across prescription type. Females were dispensed more barbiturate psychotropics, non-barbiturate psychotropics, and non-psychotropics, by a factor of 1.6–2.2 to 1 (Figure 2).

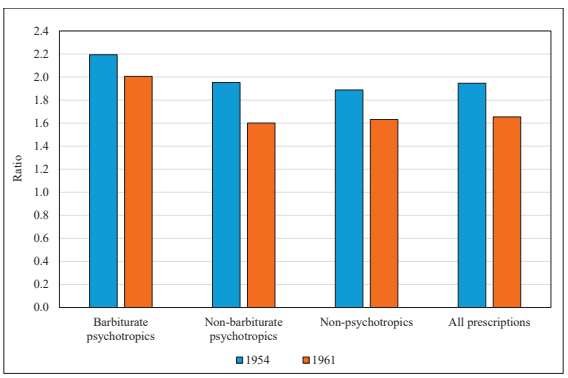

Figure 2. *Female-to-male ratios of prescriptions dispensed in a Melbourne pharmacy, by prescription type and year, based on population-adjusted prescription numbers (Table 2)*

From 1954 to 1961, there were reductions in the raw volume of dispensing of barbiturate psychotropics and non-psychotropic medicines among males, females, and persons overall (Table 2). The raw volume of dispensing of the newer non-barbiturate psychotropics, however, rose among males, females, and persons overall between the study years. These trends were maintained for each gender following adjustment for population size. While the number of different generic barbiturate drugs dispensed in 1954 and 1961 remained steady at seven, the number of different generic non-barbiturates doubled from 19 to 38 over the seven-year period (Appendices A1-A4).

Psychotropics as a proportion of all prescriptions dispensed was relatively stable across genders and years, ranging from approximately one-fifth to one-quarter (Figure 3). Among males and females in 1954, barbiturates constituted 19% of all prescriptions (Figure 3) and 77% of psychotropic prescriptions (Figure 4). Seven years later, the volume of barbiturate dispensing had dropped by more than half to 8% of all prescriptions (Figure 3) and 38% of psychotropic prescriptions (Figure 4). The corresponding gender-specific proportions were 7% of all prescriptions and 35% of psychotropics for males, and 9% of all prescriptions and 40% of psychotropics for females (Figure 3 and Figure 4). This reduction in barbiturate dispensing coincided with an increase in the dispensing of non-barbiturate psychotropics, with the proportional volume rising from 6% to 13% of all prescriptions (Figure 3) and 23% to 62% of all psychotropics (Figure 4). The rise in non-barbiturate psychotropic dispensing was similar among males and females.

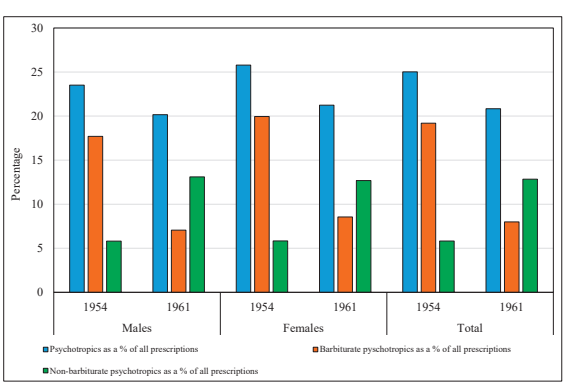

Figure 3. *Psychotropics, barbiturate psychotropics, and non-barbiturate psychotropics as a percentage of all prescriptions dispensed in a Melbourne pharmacy, by year and gender, based on population-adjusted prescription numbers (Table 2)*

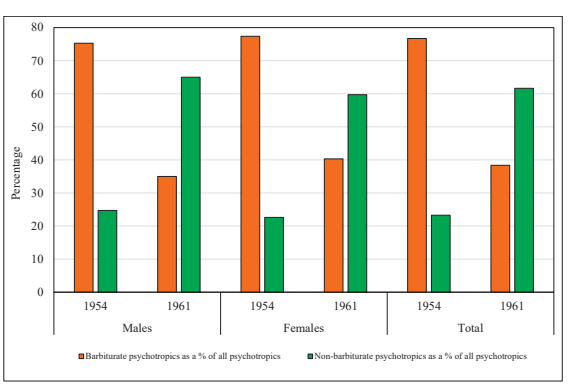

Figure 4. *Barbiturate psychotropics and non-barbiturate psychotropics as a percentage of all psychotropics dispensed in a Melbourne pharmacy, by year and gender, based on population-adjusted prescription numbers (Table 2)*

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Discussion

In 1954 and 1961, amidst the Psychopharmacological Revolution, the pharmaceutical chemists working at a Melbourne pharmacy dispensed more prescriptions to females than to males. Twice and 1.7 times as many prescriptions were dispensed to females in 1954 and 1961, respectively. Gender differences of such magnitudes were observed in each year across three mutually exclusive categories of prescriptions: barbiturate psychotropics, non-barbiturate psychotropics, and non-psychotropics. These results suggest that, at a particular Inner South East Melbourne pharmacy, females were supplied with more medications irrespective of whether or not the drugs were psychotropics intended to treat mental health disorders such as insomnia, anxiety, depression, and schizophrenia. This finding fits with a historical study showing that, at an English pharmacy over the years 1890-1922, females were supplied with more opium, cocaine, and heroin – legal drugs at the time.[38] Our finding is also consistent with modern day studies showing that women are more likely than men to visit GPs about health complaints in general.[39-41]

While psychotropics as a percentage of all prescriptions remained relatively stable over time, the observed decline between 1954 and 1961 in barbiturate dispensing at the Melbourne pharmacy is striking. The percentage of psychotropic prescriptions that were barbiturates dropped by more than half from 77% to 38%, with similar percentages observed for both males and females. The drop in barbiturate dispensing suggests that, between 1954 and 1961, these relatively unsafe psychotropic drugs were falling out of favour with prescribers. At the same time, the volume of dispensing of the newer, safer non-barbiturate psychotropics nearly trebled from 23% of psychotropics to 62% of psychotropics. This likely reflects the gradual uptake of the wide range of psychotropic drugs that were developed and marketed during the Psychopharmacological Revolution of the 1950s and 1960s. Therefore, by 1961 in this particular Melbourne pharmacy, non-barbiturate psychotropics had started to be used in preference to barbiturate psychotropics. Our results suggest that female customers were no more sensitive to these market changes than male customers. The shift in psychotropic drug utilisation from barbiturates to non-barbiturates has not been previously quantified in the literature.

The use of ratios and proportions in our study minimised the impact of the Melbourne pharmacy's decline in overall dispensing volume between 1954 and 1961. The number of total prescriptions dispensed over this period fell by 41% from 2,489 to 1,466, potentially due to increased competition from nearby pharmacies. Data collected from the Pharmaceutical Register of Victoria suggest that, in the particular suburb where the pharmacy was located, the number of registered pharmaceutical chemists increased by 32% from 28 in 1951[42] to 37 in 1963.[43] Patients who filled their prescriptions at the pharmacy in our study during 1954 may have taken their business to one of the new pharmacies operating in the suburb during 1961.

A strength of this quantitative study is the use of prescription books as primary sources of data on dispensing volumes in a Melbourne pharmacy. As prescription books needed to be maintained by all pharmacies for financial purposes prior to the availability of dispensing software, the primary data used for this study are likely to be accurate and complete. An additional strength over prior historical studies of prescription books,[44-51] including the study that assessed the gender difference in dispensing of drugs of dependence,[52] is the adjustment of results for the population at risk in the pharmacy's geographic location.

This study also has a number of limitations. While the prescription books state the titles and names of the customers to whom drugs were dispensed, they do not indicate if the drugs were in fact used and who ended up taking them. For example, a woman may have obtained a prescription medicine that was later used by a male partner or a dependent instead. If this were the case, then our results would be more indicative of healthcare seeking behaviour than drug utilisation. The cancellations observed across all prescription types reduced the sizes of the samples available for analysis; however, the sample sizes were still high at 2,489 and 1,466 for 1954 and 1961, respectively. A further limitation, relative to a modern day pharmacoepidemiological study conducted using electronic dispensing data, is the potential for errors in the reading of pharmaceutical chemists' handwritten prescriptions. The potential for such errors was mitigated through the exclusion of records where the drug name was uncertain. Additionally, our findings may have limited generalisability beyond the particular Melbourne pharmacy where the prescription books were kept.

Our findings suggest several future directions for research. As the study was conducted in only one Melbourne pharmacy, there is a need for additional research to confirm whether our findings are generalisable to other pharmacies over the period of the Psychopharmacological Revolution of the 1950s and 1960s. Another avenue is to examine the volume of barbiturate psychotropic dispensing before and after the deaths of celebrities from barbiturate overdose. Prescription rates in our study were not influenced by the news of Monroe or Garland dying from barbiturate overdose as the study period preceded these tragedies.

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Overall, our research finds that, at a pharmacy in the Inner South East region of Melbourne in 1954 and 1961, females were dispensed more barbiturate psychotropics, non-barbiturate psychotropics, and non-psychotropics than males. Among psychotropics, there was a sharp shift in dispensing from the barbiturates to newer, safer non-barbiturate drugs between 1954 and 1961, irrespective of gender.

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Appendices

Appendix A1. *Number of barbiturate psychotropics dispensed in 1954 by generic name of drug and gender*

	Male		Female		Total	
Generic Name	**Number**	**%**	**Number**	**%**	**Number**	**%**
Phenobarbital	85	64.9	215	61.6	300	62.5
Barbital	11	8.4	40	11.5	51	10.6
Pentobarbital	12	9.2	27	7.7	39	8.1
Secobarbital and amobarbital	7	5.3	18	5.2	25	5.2
Butobarbital	7	5.3	16	4.6	23	4.8
Secobarbital	4	3.1	17	4.9	21	4.4
Amobarbital	5	3.8	16	4.6	21	4.4
Total	131	100.0	349	100.0	480	100.0

Appendix A2. *Number of non-barbiturate psychotropics dispensed in 1954 by generic name of drug and gender*

	Male		Female		Total	
Generic Name of Drug	**Number**	**%**	**Number**	**%**	**Number**	**%**
Promethazine	10	23.3	27	26.5	37	25.5
Chloral hydrate	8	18.6	13	12.7	21	14.5
Hyoscine	4	9.3	17	16.7	21	14.5
Reserpine	5	11.6	12	11.8	17	11.7
Dexamphetamine	4	9.4	12	11.7	16	11.0
Methylpentynol	0	0.0	8	7.8	8	5.5
Amphetamine	4	9.4	2	2.0	6	4.2
Chlorobutanol	0	0.0	4	3.9	4	2.8
Paraldehyde	3	7.0	0	0.0	3	2.1
Valerian	3	7.0	0	0.0	3	2.1
Chlorpromazine	1	2.3	1	1.0	2	1.4
Apronal	0	0.0	1	1.0	1	0.7
Bromvaletone	0	0.0	1	1.0	1	0.7
Lithium	1	2.3	0	0.0	1	0.7
Mephenesin	0	0.0	1	1.0	1	0.7
Methylamphetamine	0	0.0	1	1.0	1	0.7
Pyrithyldione	0	0.0	1	1.0	1	0.7
Unknown	0	0.0	1	1.0	1	0.7
Total	43	100.0	102	100.0	145	100.0

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Appendix A3. *Number of barbiturate psychotropics dispensed in 1961 by generic name of drug and gender*

	Male		Female		Total	
Generic Name of Drug	**Number**	**%**	**Number**	**%**	**Number**	**%**
Phenobarbital	18	51.4	52	62.7	70	59.3
Barbital	6	17.1	9	10.8	15	12.7
Amobarbital	6	17.1	17	20.5	23	19.5
Secobarbital and amobarbital	2	5.7	3	3.6	5	4.2
Butobarbital	1	2.9	1	1.2	2	1.7
Secobarbital	2	5.7	0	0.0	2	1.7
Pentobarbital	0	0	1	1.2	1	0.8
Total	35	100	83	100.0	118	100.0

Appendix A4. *Number of non-barbiturate psychotropics dispensed in 1961 by generic name of drug and gender*

	Male		Female		Total	
Generic Name of Drug	**Number**	**%**	**Number**	**%**	**Number**	**%**
Trifluoperazine	5	7.7	14	11.4	19	10.1
Chlordiazepoxide	5	7.7	12	9.8	17	9.0
Promethazine	9	13.8	8	6.5	17	9.0
Pipradrol	4	6.2	8	6.5	12	6.4
Thalidomide	4	6.2	7	5.7	11	5.9
Chloral hydrate	6	9.2	4	3.3	10	5.3
Reserpine	4	6.2	5	4.1	9	4.8
Tranylcypromine	1	1.5	8	6.5	9	4.8
Meprobamate	2	3.1	6	4.9	8	4.3
Imipramine	4	6.2	3	2.4	7	3.7
Amfepramone (diethylpropion)	0	0.0	6	4.9	6	3.2
Arsenic	3	4.6	3	2.4	6	3.2
Promazine	2	3.1	3	2.4	5	2.7
Amphetamine	3	4.6	1	0.8	4	2.1
Dexamphetamine	0	0.0	4	3.3	4	2.1
Dichloralphenazone	1	1.5	3	2.4	4	2.1
Methylpentynol	3	4.6	1	0.8	4	2.1
Phenmetrazine	2	3.1	2	1.6	4	2.1
Prochlorperazine	2	3.1	2	1.6	4	2.1
Glutethimide	1	1.5	2	1.6	3	1.6
Isopropamide and trifluperazine	1	1.5	2	1.6	3	1.6
Chlorpromazine	1	1.5	1	0.8	2	1.1
Diethylcathinone	0	0.0	2	1.6	2	1.1
Methylphenidate	0	0.0	2	1.6	2	1.1
Perphenazine	0	0.0	2	1.6	2	1.1
Amitriptyline	1	1.5	0	0.0	1	0.5

(*continued*)

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Appendix A4 (continued)

	Male		Female		Total	
Generic Name of Drug	**Number**	**%**	**Number**	**%**	**Number**	**%**
Cyclizine	0	0.0	1	0.8	1	0.5
Dextroamphetamine	0	0.0	1	0.8	1	0.5
Hyoscine	0	0.0	1	0.8	1	0.5
Iproniazid	1	1.5	0	0.0	1	0.5
Mepazine	0	0.0	1	0.8	1	0.5
Mephenesin	0	0.0	1	0.8	1	0.5
Meprobamate	0	0.0	1	0.8	1	0.5
Methoxyphenamine	0	0.0	1	0.8	1	0.5
Pecazine/Mezapine	0	0.0	1	0.8	1	0.5
Pipamazine	0	0.0	1	0.8	1	0.5
Thioridizine	0	0.0	1	0.8	1	0.5
Tranylcypromine/trifluoperazine	0	0.0	1	0.8	1	0.5
Unknown	0	0.0	1	0.8	1	0.5
Total	65	100.0	123	100.0	188	100.0

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ARTICLE

Four pharmacy education entrepreneurs in Victorian Britain: Robert Clay (1792-1876), John Abraham (1813-1881), John Muter (1841-1911) and George Wills (1842-1932)

Norma Cox

Abstract

This article profiles four Victorian entrepreneurs who founded three private schools of pharmacy in Great Britain. The first private school of pharmacy was founded in Liverpool by Robert Clay, John Abraham and the Liverpool Chemists Association in 1849, in response to the formation of the Pharmaceutical Society of Great Britain in 1841. The second private school of pharmacy was founded by John Muter in London in 1872 (the first private school of pharmacy in London); and the third private school of pharmacy was founded by George Wills in London in 1874 (the largest and most successful private school of pharmacy in London). Muter and Wills saw the need for more education establishments following the mandatory requirements of the Pharmacy Act 1868.

Introduction

The Victorian Age in Great Britain – the period during which Queen Victoria reigned (1837-1901) – was a period of rapid change and growth. There were rapid advances in scientific, medical and technical fields and also a rise in literary works.[1] The railways developed and this opened up the country, as people flocked to the cities for work. Peoples' leisure expanded and changes were seen in the population's growth and location. The industrial revolution pushed Great Britain into global prominence, yet despite this there was social inequality which in turn initiated social reform.[2]

Pharmacy too was to undergo rapid change. The Pharmaceutical Society of Great Britain was founded by a group of prominent chemists and druggists in London in 1841, in order to protect their trade from unqualified practitioners. In the early nineteenth century anyone could practice as a chemist and druggist, and unqualified practitioners were threatening the jobs of the qualified.[3]

The founders of the Pharmaceutical Society initially laid down educational standards that were voluntary, but Jacob Bell, the Society's founder, hoped that they would become compulsory through a Pharmacy Act (1852). There was a preliminary examination before indenture as an apprentice,[4] and the Minor or Major examination had to be taken prior to qualification. Success in the Minor examination qualified the candidate to be an assistant chemist and druggist, and to be eligible for Associate membership of the Society. Before taking the Major examination a candidate needed to be in business or to be intending to commence in business, so an assistant needed to pass in order to progress.[5] The Major and Minor examinations came in at the same time in 1841-43. In the 1852 Pharmacy Act, examination success lead to the award of the title Pharmaceutical Chemist but members of the Pharmaceutical Society did not need to be Pharmaceutical Chemists to join it or stay in membership/registration.

However, British chemists and druggists in the mid-nineteenth century regarded themselves as tradesmen, and were firm believers in free trade. Many were reluctant to accept compulsory education, examination and registration.[6] As well as resistance from current practitioners, there were other obstacles in establishing a country-wide system of pharmaceutical education, for there was no national system of technical or scientific education, and the major cities had few resources.[7] It was mainly left to local groups or individual entrepreneurs to meet the need.

The first schools of pharmacy

To offer a means of proper education and instruction the Pharmaceutical Society opened a school of pharmacy in Bloomsbury in 1842, but this was only accessible to those living in London.[8] In Liverpool a group of prominent chemists and druggists were working to the same goal. They were members of the Liverpool Chemists' Association that had been formed in 1849, and they aspired to set the educational standards for pharmacy in Liverpool. A private school of pharmacy – the Liverpool School of Pharmacy – was founded in 1849. Robert Clay and John Abraham, who were business partners in the Liverpool firm of Clay and Abraham, were among the founders.

With passage of the Pharmacy Act 1868 the Minor examination became mandatory as the qualifying examination for registration as a chemist and druggist.[9] Under the Act the Pharmaceutical Society was given the responsibility of devising and conducting the Minor examination. However, there were critics of the Act who stated that compulsory examination only led to students learning just enough to pass the examination. Critics of the private schools said that students were passing the examinations after six weeks, after learning model questions and answers. In 1872 Professor John Attfield of the Pharmaceutical Society's School of Pharmacy reported that the 1868 Act was having a negative

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effect on pharmacy, making the sole goal of students that of passing the Minor examination in order to register as Chemists and Druggists. This was encouraging cramming, and with cramming there was damage being done to the ideals of pharmaceutical education.[10]

There was also a problem with providing pharmaceutical education on a nationwide basis.[11] To help with this problem the Pharmaceutical Society made small discretionary grants to local pharmaceutical associations, to enable them to organise courses of lectures. Critics said this would encourage the entrepreneur, and that this would lead to the emergence of 'proprietary' or private schools of pharmacy, which were labelled as 'cram' schools, or the 'bottom line in schooling'.[12]

Yet these private schools of pharmacy did improve the means of study, as they were specifically geared to preparing students for the qualifying Minor examination.[13] The schools' existence depended on the success of the students and the number of passes in the Minor examination. In London, a need emerged for private schools of pharmacy which just offered 'cramming' courses to prepare people for the qualifying examinations, rather than the extensive programme offered by the Society's school of pharmacy. John Muter and George Wills were two of the entrepreneurs who responded to this need by forming their own private schools in London: the South London School of Chemistry and Pharmacy (Muter) and the Westminster College of Chemistry and Pharmacy (Wills).

This article presents brief profiles of four of the men involved in forming these private schools of pharmacy in Victorian Britain.

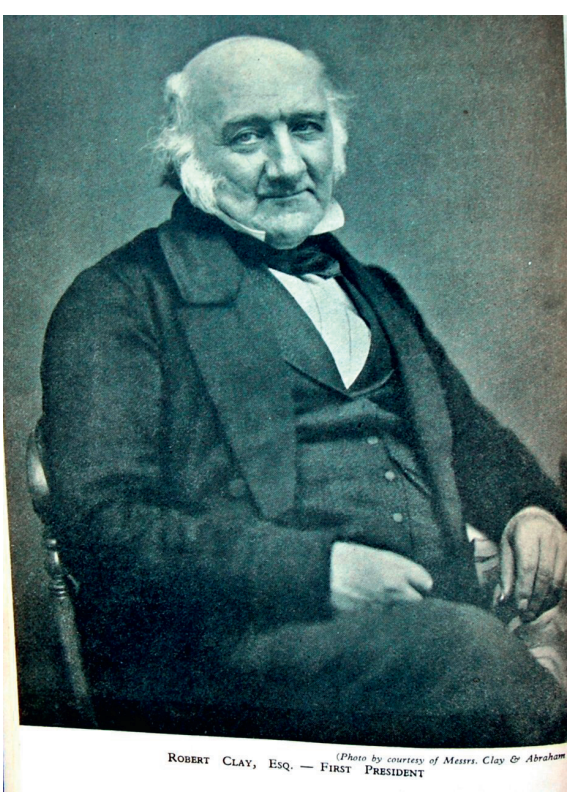

Figure 1. *Robert Clay (1792-1876) (Source: Portrait kindly supplied by Roger Hull, Liverpool Record Office)*

Robert Clay (1792-1876)

Robert Clay, who was born in 1792, was the senior partner in the firm of Clay and Abraham, a chemists and druggists' business that had been formed in 1845. Mr Clay gave his attention to the manufacturing side of the business.[14] Earlier in his career Clay, at the age of 21, worked as a druggist at 4 Ranelagh Street, Liverpool,[15] when he established the firm of Messrs Clay & Dodd & Co. in 1813, a manufacturing business.[16] The business carried on for many years under the style of Messrs Robert Clay & Co. He was joined by Mr Henry Case, an apprentice of the Liverpool Apothecaries' Company, and the name of his firm changed to Clay, Dodd & Case. The business then reverted again to the style of Clay, Dodd & Co. The company was later bought by Evans Medical Supplies Ltd in 1920.[17] In 1835 there were 128 druggists recorded in Liverpool.[18]

Robert Clay had worked at William Allen's Plough Court Pharmacy (later owned by Allen & Hanburys) in London.[19] On 30 May 1836, Robert Clay 'was a moving spirit' in the organisation of the Liverpool Apothecaries Company, which was founded with a capital of £100,000.[20] Robert Clay was the manager of the Liverpool Apothecaries' Company and he wrote

> I hereby certify that I have been actively engaged in the business of a chemist and druggist in Liverpool for the last thirty-four years and am able to declare from my personal experience that the scientific and professional measures daily practised in the establishment of the Liverpool Apothecaries Company with the view of securing pure drugs for medical purposes are most necessary in order to protect the medical profession and the public from adulteration practised in the manufacture, preparation and compounding of drugs.

The premises of the Liverpool Apothecaries' Company were at 4 Colquitt Street, and were known as the Liverpool Apothecaries' Hall. They comprised a warehouse, chemical and pharmaceutical laboratories and retail shops, erected at a cost of £30,000. Robert Clay devised the machinery by which its chemical and pharmaceutical preparations were to be manufactured.[21] The Liverpool Apothecaries' Company became a

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branch of the General Apothecaries Company which existed from 1856-1859. The Liverpool Apothecaries' Company failed 'to obtain Letters Patent' and 'struggled to make a return for investors'. To make matters worse there were competitors. In 1860 the Liverpool Apothecaries' Company went into voluntary liquidation.[22]

Robert Clay was nominated to be the first president of the newly formed Liverpool Chemists' Association on 8 June 1849.[23] Prior to 1849 and before the founding of the Pharmaceutical Society of Great Britain in London in 1841 'the chemists and druggists of Liverpool had been a disparate and disorganised group'.[24] Jacob Bell, the president of the Pharmaceutical Society came to Liverpool, to discuss the formation of the Chemists Association. However, it was decided that the Liverpool Chemists Association would be an independent body and not a branch of the Pharmaceutical Society.

The Liverpool School of Pharmacy was founded in 1849 'as an offshoot of Jacob Bell's idea to form a Liverpool branch of the Pharmaceutical Society'.[25] The Liverpool Chemists' Association evolved and initiated lectures that were held in the Royal Institution in Colquitt Street, (still the headquarters for the Association). There were classes, a library, a laboratory and a museum of materia medica. The Liverpool Chemists' Association was successful in growing medicinal plants at Liverpool's Botanic Gardens, where they gave weekly lectures and supplied specimens to the classes.[26]
Robert Clay died on 7 January 1876. He had vast experience as a scientific manufacturer, as a drugs wholesaler and as a successful chemist and druggist, all of which enabled him to make an extremely valuable contribution as a founder of the Liverpool school of pharmacy.

John Abraham (1813-1881)

John Abraham was the junior partner of Clay and Abraham, and he ran the dispensing side of the business. The business achieved a Royal Warrant to supply chemists' requisites to Queen Victoria. Abraham was born in Carlisle in 1813 and became an important pharmacist in Liverpool where he was the acknowledged 'doyen of pharmacy in that city'. Like Clay, he had worked at Plough Court Pharmacy (later owned by Allen & Hanburys) in London.[27] In 1838 he was appointed head of the dispensing department of the Liverpool Apothecaries' Company.

His term of office there explains his friendship with Dr David Waldie, who had also joined the Liverpool Apothecaries' Company in 1839, as a manufacturing chemist.[28] Dr Waldie had perfected a method to separate pure chloroform dissolved in a known volume of spirit but his work on chloroform was interrupted by two fires at Apothecaries Hall. Dr Waldie continued his work at the home of John Abraham at 87 Bold Street.[29] John Abraham resigned from the Liverpool Apothecaries Company in 1843.

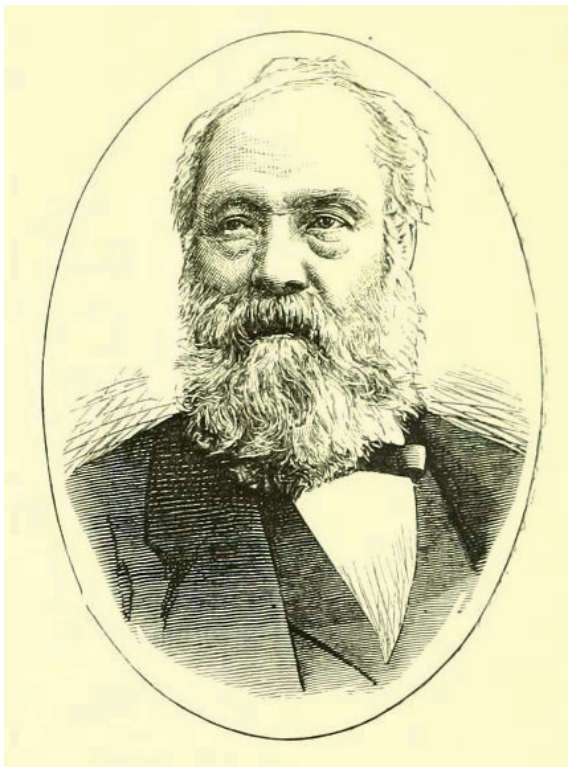

Figure 2. *John Abraham (1813-1881) (Source: Chemist and Druggist.1881; 23: 148)*

John Abraham's philanthropic and political activities saw him associated with many learned societies in Liverpool. He was treasurer and later president of the Polytechnic Society, he was on the committee of the Lyceum News-room, and he was president of the special committee set up in 1849 to monitor the progress of cholera in Liverpool. He was also honorary secretary for 25 years, and later co- president, of the Female Penitentiary. He was a founder of the Naturalists' Field Club and later its treasurer. He was president of the Liverpool Microscopical Society, which later became the Liverpool Natural History and Microscopical Society.

He was involved in forming the Gallery of Inventions and Science in connection with the Free Library and Museum. He was a director of the Liverpool Institute and Queen's College and later president. He served on the committee of the Royal Society for the Prevention of Cruelty to Animals (RSPCA).[30] John Abraham was also president of the Liverpool Chemists' Associa-

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tion in 1856, 1857 and again from 1869 to 1871.[31] He had served for four years (1867-71) on the Council of the Pharmaceutical Society of Great Britain and was one of its examiners. He was also the first president of the Liverpool Registered Chemists and of the Liverpool Chemists' Early Closing Associations.

The Liverpool Chemists' Association soon established itself as a force in pharmacy, and when in 1885 the head of chemistry for the School of Pharmacy resigned from this position, the Council of the Liverpool Chemists' Association appointed committees to approve the curriculum and arranged for a continuance of the revised curriculum. Clay and Abraham's names occurred regularly in the minutes of those meetings.[32]

The Liverpool School of Pharmacy (established in 1849) thrived, and (by 1885) 'this purely private school had developed into an officially recognised institution'.[33] John Abraham was an experienced chemist and druggist and an administrator with a wealth of pharmaceutical and scientific knowledge, which made him well-placed to found the Liverpool's School of Pharmacy on a firm footing. The Liverpool school was the United Kingdom's last surviving private school of pharmacy. Even though the pupil numbers had fallen by half during the Second World War, it remained a private school until 1953. In 1970 it merged with the Regional College of Technology. In 1971 it became part of Liverpool Polytechnic, and today it is part of Liverpool John Moore's University.[34]

John Abraham died in March 1881. The retail business of Clay and Abraham continued until 1969.[35]

Dr John Muter (1841-1911)

In 1872 Dr John Muter opened the South London School of Chemistry and Pharmacy at 289 Kennington Road, London. It was the first private school of pharmacy in London. Muter was born in Glasgow in 1841. His father was Dr J. D. Muter, who was professor of materia medica at the Portland Street Medical School, Glasgow. On his mother's side he was related to the founder of the Glasgow Society of Apothecaries. By profession Muter was a chemical analyst, not a pharmacist. He studied at Glasgow University for several years and subsequently attended the medical curriculum provided at the Andersonian University, studying chemistry and anatomy.

Muter was awarded several prizes and certificates in chemistry classes. He became an assistant to Dr Penny, the professor. However, he had a serious illness which forced him to stop work. On partial recovery he travelled to France, Germany and Austria. He took the degree of PhD at the University of Rostock in northern Germany. Muter realised that the Pharmaceutical Society's School of Pharmacy could not cope with the number of candidates applying for the Minor examination and with the financial incentive offered by the Pharmaceutical Society he became the first person in London, outside the Pharmaceutical Society's School of Pharmacy, to tackle the necessity for qualification as a result of the Pharmacy Act 1868. He began to prepare pupils for examination and in 1868 'from a small beginning he started teaching pupils to qualify them'.[36]

Figure 3. *John Muter (1841-1911) (Source: Chemist and Druggist.1911; 79: 57 Index Folio 929)*

Later in 1873, his School of Chemistry and Pharmacy moved to a newly built school at 325 Kennington Road.[37] An advert in 1875 showed the South London School of Chemistry and Pharmacy; it offered education to 'Class A students' who were those who could study up to ten months continuously. 'Class B students' were those who had already obtained privately a knowledge of the subjects, who 'desired to perfect their studies and were yet unable to remain in London for longer than three months'.[38]

The private schools were popular and good value for money. They concentrated courses to three months to enable students to pass the examinations. Their courses were held in the evenings and were easier to attend than full-time courses. At this school there were prizes, medals and certificates of attendance, and merits were awarded to 'diligent students'.

John Muter stated that, because the Minor examination was easy to cram for, he taught it in an intensive way. However, his intention was to provoke a change in order to make the examination more thorough. When this was achieved, he changed his teaching methods. Many in pharmacy were grateful for John Muter's thorough tuition. An example of his students' gratitude was seen

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> On 12 July 1875, this being the closing day of lectures for the summer season at the South London School of Chemistry and Pharmacy. The students of the pharmacy class assembled to present Dr Muter with a handsome and richly- chased silver inkstand bearing a suitable inscription, in token of his untiring energy in promoting their education. Some time ago the lecturer on pharmacy and materia medica had died and his position and his place had been filled temporarily. The latter gentleman, having been unwell for some weeks, Dr Muter immediately offered to lecture on the whole subjects taught at the School. He carried out the arduous task so that there was some extra reason for students to mark their recognition for Dr Muter's zeal and ability as a teacher.[39]

The *Chemist and Druggist* recorded that "This was not the first testimonial by many that Dr Muter has received".[40] The confidence of the South London School of Chemistry and Pharmacy was seen in a large advertisement in 1879, which promoted their facilities with a picture of a new laboratory. The advertisement boldly stated 'For the eleventh session 1879-1880, a laboratory the most elegantly fitted in Great Britain'. It also stated '1,200 living witnesses to its success on the role of the chemist', and finally 'the Directors continue to spare no expense in giving the greatest facilities and in providing the most competent lecturers, so as to ensure the student both present success and permanent benefit in after life'.[41]

Later South London School of Chemistry and Pharmacy was known as 'Muter School of Pharmacy'. In the 1870s there was opposition to women in pharmacy and the women students found it difficult to obtain instruction in a chemical laboratory, until Dr Muter opened his laboratories to them. The Muter's School produced several noteworthy women pharmacists, such as Louisa Stammwitz and Rose Minshull. Miss Stammwitz – along with Rose Minshull and Mrs Alice Hart – signed a petition to allow female students access to the Society's chemical laboratories. It was not until after they had passed their Minor examinations that the Pharmaceutical Society's School of Pharmacy opened their laboratories to women.[42]

Following the Technical Instruction Act of 1889 there was competition from public establishments that were dedicated to teaching pharmacy. There were two new Polytechnics in South London; the South Western Polytechnic Institute on Manresa Road in Chelsea, and the Battersea Polytechnic, on Battersea Park Road. By 5 December 1900 the South London School of Chemistry and Pharmacy Limited went into liquidation.[43]

Muter's vast experience as a scientist and researcher was shown in his research publications during the years 1877-1900. He had fifteen memoirs on the analysis of food published in *The Analyst*, a journal which he co-founded (1877) and co-edited (1877-91).[44] His knowledge and determination made him a very capable founder of a private school of pharmacy.

John Muter carried on working as a public analyst for six London boroughs until his death in 1911.[45] The Muter's School of Pharmacy was resurrected in 1904 and continued until 1924, having been renamed The London College of Chemistry, Pharmacy and Botany, incorporating the South London School of Pharmacy (Muter's).[46] The building at 325 Kennington Road remains today; the front of the building is an estate agents.

Figure 4. *George Wills (1842-1932) (Source: Kurzer, Frederick. Medical History. 2007; 51: 499)*

George Wills (1842-1932)

George Sampson Valentine Wills was born in Roade, Buckinghamshire near Stony Stratford on 14 February 1842. His ancestors had been builders and his great grandfather had been a stone mason. He was educated at the British School in Stony Stratford and also attended the town's chapel where he played the organ. He loved music all through his life. On leaving school he worked with a local eccentric who practised 'physic 'among the country folk. Wills made simple remedies which were used by the 'physic' healer.

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Wills increased his knowledge of plant and drug lore through reading. He was apprenticed to a chemist and druggist in the town. The business changed hands twice in quick succession and Wills was transferred along with the stock. His second employer, Mr Benjamin Bullus, took an interest in Wills' progress and appointed him as assistant in a new venture at Hookley Hill, Birmingham. In 1870 Wills worked in similar positions in Hay-on-Wye, Barrow-in-Furness and Folkestone.[47]

After two years of private study Wills passed his Minor examination in 1873.[48] After this he applied for the position of dispenser in the medical practice of Dr C. F. DuPasquier, Apothecary to the Queen's Household. Wills obtained the post out of sixty other applicants but a problem arose when it was realized that Wills did not hold the Dispenser's Certificate of Apothecaries' Hall, which was in fact inferior to the Minor examination but in DuPasquier's eyes it was an essential for Royal Service. Wills assured DuPasquier that he would pass the necessary examination for the Apothecaries' Hall Certificate in three days without further study. The examination was held weekly and Wills passed.

Wills had plenty of free time in this new employment and in this time he devised a system of postal instruction to help young colleagues in the provinces who struggled to study for the qualifying examinations. Wills' postal scheme was an instant success and this encouraged him to resign from his post with Dr DuPasquier and change his career to teacher and educationist.[49]

The Westminster College of Chemistry and Pharmacy

Wills founded the Westminster College of Chemistry and Pharmacy in October 1874 in his house at 133 St George's Road Lambeth. At first only two rooms were fitted up as laboratories and the number of pupils was small but soon more rooms were used for teaching. When the whole house was taken up for teaching, two more adjoining houses in nearby Lambeth Road were added.[50] Meanwhile George Wills passed the Major examination in 1876.[51] Due to further growth, the college then transferred to two large Halls in North Street Kennington. The college now added a disused Baptist Chapel in Trinity Street Southwark in 1882, which held 100 students. In the chapel, two galleries were

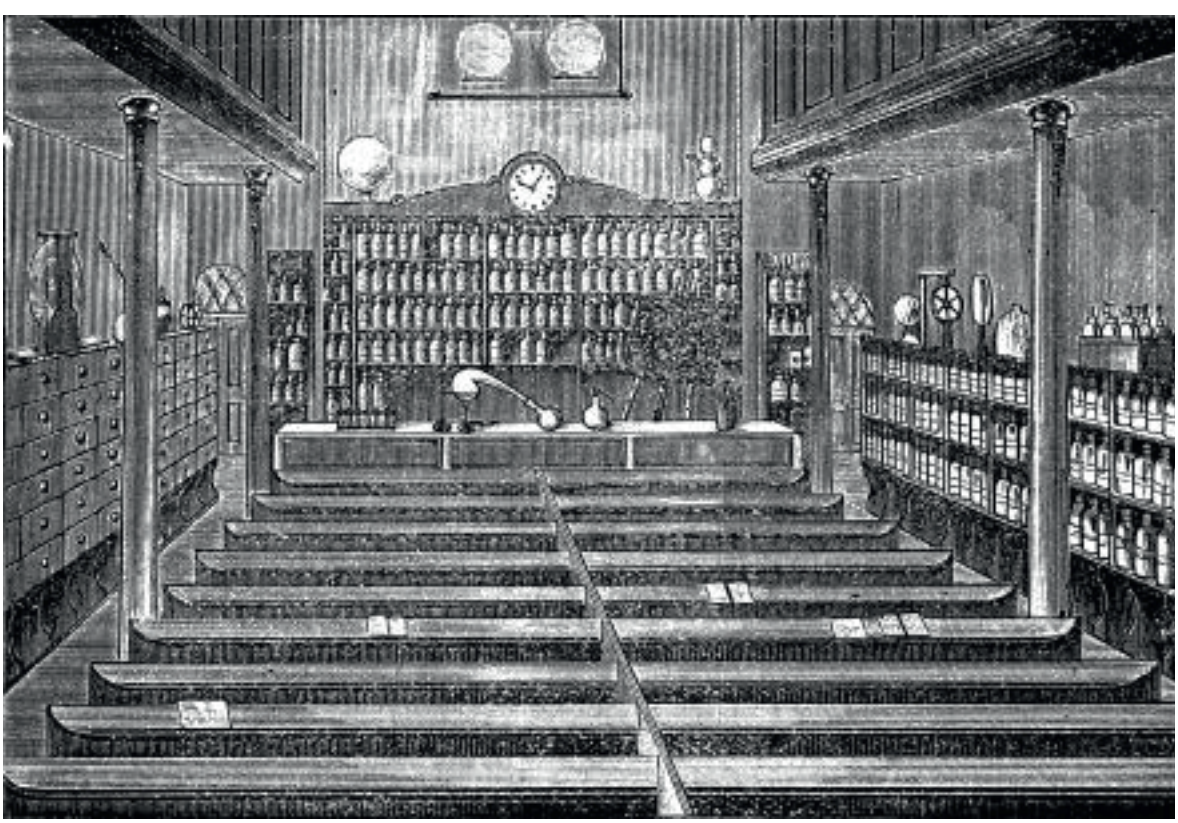

Figure 5. *Westminster College lecture hall c.1890 (Source: Kurzer, Frederick. Medical History. 2007; 51: 486)*

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levelled and enclosed. They were fitted up as a chemical laboratory with 74 work places along one wall and smaller rooms for practical work along the other wall. The lecture Hall accommodated extra students but for practical and special subjects the class was split into five groups.

These groups were rotated each term. On three evenings a week, part-time students studied until 9pm.[52] The work of the postal system continued behind the scene. The syllabus used was prescribed by the Pharmaceutical Society. The lectures were illustrated with demonstration experiments, large diagrams and charts which were drawn on to calico wound on to rollers. Biological drawings were done by Wills' eldest daughter Georgina, who was a trained artist and designer.[53] There were strict rules at the College especially regarding punctuality and safety in the laboratory. Students had to absorb and memorise a lot of factual information as well as having practical sessions. Dispensing included the deciphering of doctors' prescriptions.[54]

There were weekly tests and end of term examinations with medal and certificate prizes offered. The fees were moderate, the costs in 1899 of the Minor Course was 8 guineas per term reduced to 12 guineas for two terms payable in advance. One payment of 15 guineas secured tuition until qualified. The cost for the Major examination was 6 guineas per term. The postal courses cost one guinea for a full course of 100 lessons sent in 50 instalments, postage costs were small and spread over one year or more, access to this postal tuition was available to all.[55] Up to sixty students from outside London could stay in approved full- board accommodation for 1 guinea per week. The loss of potential earnings during full-time study discouraged many candidates and they would use the College's evening classes, at the low cost of 1 guinea for one evening a week per term or use the postal courses.[56]

After three years Westminster College was the largest of its kind in London and had achieved nearly as many examination passes as all the other schools in England put together. It had achieved this result when more than half of the candidates regularly failed the Minor examination. By 1900, Westminster College of Chemistry and Pharmacy had enabled 4000 chemist and druggists to successfully register with the Pharmaceutical Society, out of a total of 16,000 nationwide.[57]

Westminster College continued to be successful but in 1908 a financial disaster occurred. Wills had established a pharmacy business in 1898 near his home in South Croydon. The venture was not a success and Wills lost his house and his personal assets. The failure resulted in the voluntary liquidation of Westminster College, which had been registered as a limited company in 1901. The disruption of the College lasted a few months and Wills soon resurrected the Westminster College at new premises at 402 Clapham Road, Lambeth, a neighbourhood which by 1908 already had five other private schools of pharmacy nearby. Between them the six private schools supplied the greater part of the privately trained pharmacists for the entire country.[58] The other private schools of pharmacy are listed in Table 1.

The Westminster College of Chemistry and Pharmacy moved to 190 Clapham Road in 1918. During the Second World War between 1939 and 1945, the site of Westminster College at 190 Clapham Road, was destroyed by bombs.[59] The last advertisement for the College appeared in the *Chemist and Druggist* in August 1939, where it stated that 'the School now specialises solely by revision and preparatory work by post'.[60]

George Wills was the author of two dozen textbooks and manuals on the pharmaceutical syllabus.[61] He had great knowledge and skill as a teacher and administrator. He also had endless energy for work which made him ideally suited to be the founder of this successful private school of pharmacy. Wills remained in sole charge of the College up to the age of 76. He died on 28 April 1932 aged 84.

Conclusion

Pharmacy entrepreneurs played a crucial role in shaping the education of pharmacy students. The four profiled here used their skills and experience to set about founding three of the private Schools of Pharmacy established during the Victorian era. In 1849 Robert Clay and John Abraham, together with other members of the Liverpool Chemists Association, founded the Liverpool School of Pharmacy. Nineteen years later, following the 1868 Pharmacy Act, the qualifying examinations of the Pharmaceutical Society of Great Britain became compulsory. The Society's own School of Pharmacy could not cope with the large number of students who needed to prepare for the qualifying examinations. John Muter started teaching a few pupils, and in 1872 he established the South London College of Chemistry and Pharmacy. Two years later George Wills founded the Westminster College of Chemistry and Pharmacy.

These private schools of pharmacy provided the opportunities to enable students to achieve the mandatory qualifications that followed the Pharmacy Act of 1868. The education and examination of pharmacy students became the bedrock for the professionalization of pharmacy in Great Britain. The personalities of these founders of the schools of pharmacy played a major role in the success of the private schools of pharmacy.

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Table 1. *South East London's private schools of pharmacy 1872-1939 (Sources: See Note 36 and Education Information notes in Chemist and Druggist 1872-1939)*

Name of school of pharmacy	London addresses	Year opened	Year closed
South London School of Pharmacy and Chemistry; South London School of Pharmacy (Muters); Muters South London School of Pharmacy; London College of Chemistry & Pharmacy (incorporating the South London School of Pharmacy).	289 Kennington Road; 325 Kennington Road; 325 & 409 Kennington Road; 325 Kennington Road; 361 Clapham Road.	1872 1873 1900 1902 1911	1924
Westminster College of Chemistry and Pharmacy.	133 St George's Road, Lambeth; 62 Lambeth Road; Trinity Square, Borough; 402 Clapham Road; 190 Clapham Road.	1874 1878 1882 1908 1918	1939
Metropolitan School of Pharmacy.	162 Kennington Park Road; 160 &162 Kennington Park Road.	1893 1900	1908
Brixton School of Chemistry and Pharmacy; Brixton School of Pharmacy; Brixton School of Chemistry & Pharmacy.	12 Knowle Road, Brixton; 12 Knowle Road, Brixton; 171 Brixton Road; 78 Stockwell Park Road.	1898 1900 1902 1906	1910
London College of Chemistry, Pharmacy & Botany; London College of Pharmacy, which incorporated the South London School of Pharmacy founded by Muter in 1868; London College of Pharmacy.	323 Clapham Road; 361 Clapham Road. 361 Clapham Road.	1899 1911 1925	1939
South of England College of Pharmacy.	186 Clapham Road.	1906	1926

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SHORT COMMUNICATION

Four Nuremberg medicinal weights recovered from the wreck of the seventeenth century Swedish warship HMS KRONAN

Björn Lindeke

Abstract

In June 1676 the Swedish royal ship KRONAN perished into the Baltic Sea in an explosion off the east coast of Öland, while engaged in a battle against an allied Danish-Dutch fleet. The discovery of the ship's wreck in 1980 marked the start of a marine-archaeological project that to date has produced nearly 35,000 objects. It constitutes a peephole straight into many aspects of late-seventeenth century Swedish society. Among the plethora of finds, a pharmaceutical-medicinal context has been recognised, comprising about 200 items so far. The present contribution focuses on the identification of four medicinal weights recovered from the wreck site over a period of thirteen years. The weights are fully characterized with respect to type and size, and traced to their production site, manufacturer, and approximate year of production.

Zusammenfassung

Im Juni 1676 sank das königlich schwedische Kriegsschiff KRONAN im Gefecht gegen die vereinigte niederländisch-dänische Flotte in der Ostsee aufgrund einer Explosion an der Ostküste Ölands. Das im Jahr 1980 entdeckte Wrack des Schiffes markierte den Beginn eines meeresarchäologischen Projekts, bei dem bis heute circa 35 000 Objekte geborgen wurden. Der Fund bietet ein Guckloch geradewegs in die verschiedenen Aspekte einer Gesellschaft des 17. Jahrhunderts. Unter der Vielzahl an Objekten sind bis heute über 200 Einträge zusammengetragen worden, die in einen pharmazeutisch-medizinischen Kontext gehören. Dieser Beitrag beschäftigt sich mit der Identifikation von vier medizinischen Gewichten, die über einen Zeitraum von 13 Jahren von dem Wrack geborgen wurden. Die Stücke werden vollständig nach Typ und Größe beschrieben. Zusätzlich wird Fragen zum Herstellungsort, der Manufaktur sowie dem Zeitfenster nachgegangen.

Introduction

On 1 June 1676 the Swedish Navy was hit by one of its greatest ever disasters when one of its men o' war, the royal ship KRONAN ('The Crown'), perished into the Baltic Sea in an explosion off the east coast of Öland. This mark of disgrace occurred during a skirmish with an allied Danish-Dutch fleet, and is attributed to bad seamanship within the Swedish squadron. The rediscovery of the ship in 1980, at a depth of 28 metres and a position 3.4 nautical miles due east of the village of Hulterstad on southeast Öland, marked the start of a marine-archaeological project in 1981 directed by the Kalmar County Museum.[1] Shipwrecks like that of the KRONAN reflect societies in miniature, and it was immediately realised that such a closed find constituted a peephole straight into numerous aspects of late-seventeenth century society. With 850 people (albeit all men) on board, the KRONAN constituted a floating society in terms of both crew numbers and social structure, during a period when there was rarely any clear distinction between military and civilian society.[2]

Underwater work on the KRONAN has taken place for three to four weeks every summer since 1981, and so far has produced around 35,000 finds. Among this plethora of objects, a pharmaceutical-medicinal context has been uncovered which so far comprises about 200 items. This communication presents the identification of four medicinal weights, recovered as isolated finds from the wreck site over a period of thirteen years (Figure 1).

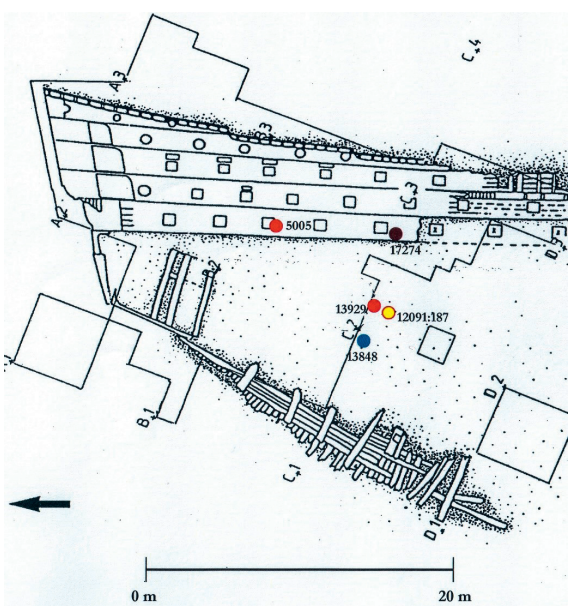

Figure 1. *Detail of the site plan of the KRONAN, showing the distribution and relative location of the medicinal weights KLM 12091KR:187, KLM 13848KR, KLM 13929KR and KLM 17274KR. (Source: Drawing: Lars Einarsson/Kalmar County Museum)*

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Medicinal weight systems

The apothecaries' weight system – which was to become the one predominantly used in several areas of the European continent by apothecaries in the composition of medicinal drugs – had its hub in Nuremberg, where it was established by medical regulation in 1555. The system pertains to information given in the *Dispensatorium* by the German-born physician and natural scientist Valerius Cordus (1515-1544).[3] The standard for the Nuremberg pharmaceutical weight, 1 libra, (the apothecaries' pound) was composed of 12 ounces, the latter being divided in turn into drachmas, then into scruples, and finally into grains, as follows:

1 libra	356.28 grams	
1 ounce	29.69 grams	twelve to the libra
1 drachma	3.71 grams	eight to the ounce
1 scruple	1.24 grams	three to the drachma
1 grain	62 mg	twenty to the scruple

The reference standard was the ounce made in silver that was kept secure in the city hall of Nuremberg. In Sweden the system was introduced in the 1660s. Its use was ratified in the Medical Ordinance of 1688 and then applied until 1869, when it was abandoned due to the introduction of the metric system of measurements by a new royal ordinance.[4]

Medicinal weights deposited in the Baltic

The wreck site of the KRONAN comprises a plethora of objects that have been deposited in the sand at the bottom of the Baltic for more than 300 years. Of the items salvaged over the years, the pharmaceutical-medicinal items constitute quite an extensive collection.[5] This closed context consists of partly destroyed small cabinets and chests, along with numerous solitary finds. Today, taken together these make up an astonishing catalogue of 200 entries, dominated by cases and jars containing drugs. Finds of medical instruments and tools are proportionately few, but from among the large quantities of odds and ends, classed as solitary finds, four apothecary's weights (Figure 1) have now been recognized as true pharmaceutical-medicinal artefacts.

The first weight to be discovered (KLM 12091:187 KR) was recovered in 1999 from the ship's orlop deck. It originated from part of a closed find context in the form of a wooden chest (KLM 12091:1 KR) comprised of no less than 253 artefacts of different types. The weight is listed as a piece of metal in the divers' log. The first consideration of the find as being an apothecary's weight was based upon its form and size. It measured 18.5 x 18.5 mm at the base and 13 x 13 mm at the top, with a height of 14.5 mm; it weighed – encrustations included – 29.76 grams (Figure 2). After scrutiny, this proved to be in accord with a one-ounce weight (nominal weight 29.69 grams).

Figure 2. *The 1 Ounce (KLM 12091:187, left) and the ½ Ounce (KLM 17274KR, right) weights prior to conservation. (Source: Photo by Stina Damberg/Kalmar County Museum, 6a)*

Four years later, in 2003, this was followed by the discovery of two smaller weights, with the appearance of the two-scruple weight (nominal weight 2.48 grams). One (KLM 13848 KR) was heavily corroded, while the other (KLM 13929 KR) exhibited an almost mint condition. It measured 16.5 x 19.3 mm, with a thickness of 1.7 mm, and a weight of 2.38 grams (Figure 3b). Its lower right "horn" bears signs of filing by an adjuster.

Both scruples were found in the ship's hold, and the distance between the deposits was 2½-3 metres. The distance between the better-preserved scruple (KLM 13929 KR) and the ounce (KLM 12091:187 KR) was only 0.5 metres (Figure 1). The latest weight (KLM 17274 KR) so far discovered was compatible with a half-ounce (nominal weight 14.84 grams). It was an isolated find on the lower deck, five to seven metres away from the other weights (Figure 1). It was not retrieved until the summer of 2013, some fourteen years after the discovery of the first weight. Its dimensions were 14.5 x 14.5 mm at the base and 10.5 x 10.5 mm at the top, with a height of 12.5 mm; it weighed 15.21 grams, encrustations included (Figure 2). All of the weights were assumed to be made of brass.

The objects were subjected to cleaning in a series of stages, in accordance with applicable standard procedures. From the very outset, the mark "C W" or "G W" was perceptible on the non-corroded two-scruple weight, and after careful mechanical cleaning it became clearly visible as "C W" within an oval. The golden brass surface was restored by further cleaning, using the metal-complex former, EDTA (Figure 3b). The half-

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Figure 3. *The ½ Ounce (KLM 12091:187, 3a left) and the 2 Scruple (KLM 13929KR, 3b right) weights after conservation with the maker's mark "CW" clearly visible. (Source: Photo by Stina Damberg and Max Jahrehorn, respectively/Kalmar County Museum)*

ounce and the ounce were then subjected to careful mechanical cleaning, whereupon marks became successively visible on their bases.

The ounce weight was clearly marked with the established symbol for an ounce followed by the Roman numeral I, for one; while the half-ounce weight was marked with exactly the same symbol but followed by an s, representing semi, the Latin word for half (Figure 3a). Both weights carried the mark "C W" within an oval, clearly visible and in a similar fashion to the scruple. The half-ounce (KLM 17274 KR) weighed 14.45 grams after cleaning; the ounce (KLM 12091:187 KR) weighed 29.13 grams.

Analysis of the metal composition of the weights was performed at ALSAC laboratories in Uppsala, Sweden. The alloys were analysed using a Shimadzu EDX fluorescence spectrometer. Results are summarised in Table 1.

The provenance of the medicinal weights

The style of the makers' mark is consistent with a Nuremberg source. However, due to Swedish trading connections at the time, the possibility that these weights could have originated from Antwerp or elsewhere in the Low Countries could not be disregarded. Conceivable information in contemporary historical source material was searched for, in an attempt to ascertain the origin of the weights. It became evident that the mark "C W", that appeared on all of the weights, was that belonging to Christoph Weinmann, a weight-maker active in Nuremberg at this actual time. According to Lockner, Weinmann used a wolf conjoined with the letters "C W" arranged vertically inside an oval, or the letters by themselves inside an oval.[6] Weinmann used these stamps as his maker's mark from 1667 onwards. Additional information in the Nürnberger Künstlerlexikon states that he became a master craftsman

Table 1. *Composition of the alloys (Shimadzu EDX-7000) and actual weights*

Object	Copper Cu %	Lead Pb %	Zinc Zn %	Antimony Sb %	Tin Sn %	Arsenic As %	Nickel Ni %	Actual weight
2 Scruple weight (KLM 13929 KR)	70	13	7.7	3.3	3.2	1.0	0.9	2.4g
1 Ounce weight (KLM 12091:187 KR)	33	50	1.8	2.6	5.5	0.2	0.3	29.8g
½ Ounce weight (KLM 17274 KR)	32	50	4.3	4.9	5.9	0.8	0.9	15.2g

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in 1657, and in 1669 a sworn master craftsman ("geschworener"), which means that he then supervised production quality in Nuremberg.[7]

The results from the analysis of the alloys, which, at present, are applicable only to their surfaces, should be regarded as approximate and indicative, rather than conclusive. With a copper content of 70 per cent the alloy of both two-scruples appears to be closest to that denoted for brass, while the alloys of the ounce and the ½-ounce contain surprisingly high amounts, 50 %, of lead.

There are differences in their production: the ounces have been moulded directly, while the much smaller scruples are cut off larger pre-moulded billets. The difference can be noted already on visual inspection. Despite the fact that the registered weights do not deviate substantially from the designated ones (see above), after more than 300 years in the Baltic, the effects of corrosion have to be taken into account.

The weights that occur in the medicinal context at the wreck site of the KRONAN originate from Nuremberg, where they were made by the master brass-smith and weightmaker, Christoph Weinmann. According to what we know about his maker's mark, these weights must have been cast in 1667 or later, though before the warship's disastrous naval campaign. The KRONAN was launched on 31 July 1668. However, things moved slowly and with the ship moored at Skeppsholmen, the naval shipyard in Stockholm, the fitting was still ongoing in the summer of 1674. The KRONAN participated in her first naval campaign in the autumn of 1675.[8] Perceivably the weights were among the medicinal goods brought aboard the ship just prior to this campaign.

The archeologically retrieved weights, as tokens of medical activity on board the KRONAN, have now been fully characterized with respect to type and size of weight, and they have been traced to their site of production and manufacturer. Moreover, we know that the maximum time-span from casting until they sank into oblivion was eight years. However, these pieces of information, rendered possible by this look through a keyhole into June 1676, raise some additional questions. Why were there medicinal weights on board the KRONAN in the first place? Who were the actors responsible for taking them on board? Why were they of foreign make – produced in Nuremberg – and not of domestic manufacture?

Discussion

Medicinal weights are intended to be used solely in the handling of drugs, for example in the preparation of a remedy according to a given prescription. This is a task undertaken by an apothecary or a barber-surgeon. At the time of the provision of the KRONAN, the doctor of the Admiralty was Peter Schallerus (16??-1676), a Swede educated at Uppsala University. He was responsible for the organisation of medical service in the Navy, and he was assisted in this task by the apothecary of the Admiralty, Alexander Stecker (16??-1676) and its barber-surgeon, Herman Fuchs (1620-1676).[9] Like most apothecaries of this period (see below), the latter two were both Germans with well-established networks. When the KRONAN sank Schallerus and his two colleagues were on duty on board and perished, to become recorded as missing in action.

Thus, we find these leaders of the Navy's medical professions among the 800 lives lost. Fuchs and Stecker were members of the German community in Stockholm. Fuchs was born in Hamburg and started his education as barber-surgeon in Stettin. Notably, at the age of eighteen, he became a barber-surgeon under the patronage of the Swedish councillor Gabriel Oxenstjerna (1619-1673), and in 1641 he started his engagement within the Swedish army. He held the position of barber-surgeon, and was posted to three Swedish embassies: with Count Magnus Gabriel De la Gardie (1622-1686) to France; with Eric Gyllenstjerna (1602-1657) to Moscow; and with Count Nils Brahe (1633-1699) to England. He was on duty at the Siege of Prague before being recruited to the navy in 1654.[10]

In the year 1682, Stockholm was credited with having 947 craftsmen, 284 of whom were foreign, apprentices included.[11] Five pharmacies were in operation in the city in the 1670s; notably, four of them were run by Germans.[12] The Guenon Pharmacy (1623) was owned by George Christion Dauer from Prague, the Angel Pharmacy (1649) by Christopher Molitor from Cassel, the Swan Pharmacy (1650) by Samuel Ziervogel from Mansfield, and finally the Blackamoor Pharmacy (1670) by Christian Heraeus (1643-1691), a native of Güstrow. All later became naturalized Swedish citizens. Notably, some of them moved from what had become Swedish provinces at the time. From the very beginning, Swedish apothecaries were part of a culture which was firmly grounded in the world of German cities and towns; their spheres of influence and activity were independent of territorial borders, at least within the Protestant segment of Europe.[13]

Christian Heraeus, recognized for his learning, came to Sweden under the patronage of the Swedish Lord High Constable Carl Gustaf Wrangel (1613-1676). As a member of Wrangel's court he arrived in Sweden in 1669. He was the son of a physician in the family of Count Johan Alberecht II of Mecklemburg-Güstrow.[14] Christian Hereaus ended up as a court

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apothecary, and eventually as personal physician to the queen dowager, Hedvig Eleonora. Investigations of contemporary historical documents in war archives reveal that, while the medicine chests and canisters were prepared by the carpenters at the naval shipyard, the contents of these medicine chests should be delivered preferentially by Christian Heraeus at the Blackamoor Pharmacy, that was later to become designated 'Pharmacy of the Admiralty'.[15]

Through his engagement in the Thirty Years' War, Carl Gustaf Wrangel became an important Swede on the European arena. He governed part of the newly acquired provinces (the Swedish Vor-Pomerania) of the Swedish realm. Together with others (see above), as a magnate he was instrumental in establishing countless foreign contacts all over Europe; in his capacity as a significant patron, he could attract learned men and knowledge from abroad.[16] He did not even hesitate to act on medical matters. On one occasion during his appointment as Admiral of the Navy, he himself ordered medicinal supplies from Amsterdam.[17] The order contained 95 different items to be used in the Polish War in 1655. This order was made at the time when both Peter Schallerus and Herman Fuchs were under his command. During the Nuremberg Peace Congress in 1649-1650 Wrangel built numerous contacts in that free city, notably Jacob Barth and Johann Eggerdt, who assisted him in various businesses of an official as well as a private nature.[18]

From the fourteenth century and into the Thirty Years' War, Nuremberg was an important craft centre within Europe.[19] It was a free city (not to be ruled by the kings of Bavaria) and despite Catholic surroundings it remained Protestant. A Protestant city like Nuremberg was going to be a supporter of Gustav II Adolph (1505-1632), and its ties to the Swedes grew stronger following the Battle of Breitenfeld in 1631.

Spanning over the early modern period, there were around 200 weight-producing workshops in the city. For the brass-smiths, Nuremberg was a "closed shop" during the sixteenth and early seventeenth century, which meant that no apprentices were allowed other than those born to burghers of the city. This explains why, when looking for our weight-maker "C W" during this period, we astonishingly encountered more than fifty Weinmanns denoted as Nuremberg brass-smiths or weight-makers. The latter produced weights according to local European weight standards.

The first Swedish brass factory was founded in 1571 and seven brass producers, including manufacturing units, were in operation around 1670.[20] They were all owned and managed by a tight-knit network of individuals originating from families in Amsterdam, Antwerp and the industrialized borderland around Aachen, many of whom eventually became naturalised Swedish citizens.[21] The enterprise developed into a monopoly, infamous for its "Swedish brass barons".

Thus, Sweden's brass production did not originate from Nuremberg and even though a domestic production of utility goods made from brass became plentiful in the seventeenth century, precision objects like the renowned Nuremberg nested cup weights were imported. This import successively decreased during the eighteenth century as production was taken over by skilled local weight-makers, especially in Stockholm. Since most craftsmen and merchants were at this time foreigners, it was not unlikely for an occasional one from Nuremberg to make an appearance.[22] The guild of the brass-makers in Stockholm was founded on 27 June 1720, but the casting of nested weights did not start until 1760. [23]

Apart from the medicinal weights, there are other exclusive objects found in the wreck of the KRONAN to be classified as Nuremberg metalware. These include a folding sundial, a trumpet and a set of nested cup weights (KLM 12091:227 KR). The sundial was a very early discovery, found in the beginning of the 1980s, and it carries the master's mark "B H" ascribable to Barent Henrickle, active in Nürnberg around the turn of the sixteenth century.[24] The trumpet was found on the middle deck of the ship. It is a somewhat sophisticated orchestral instrument made in Nurnberg in 1654, ascribable to the celebrated maker Michael Nagel.[25] It has not yet been possible to connect the merchant's nested cup weights to a specific maker in the city.

Conclusion

On the supply side, one could easily draw on several Swedish-German trading networks that had connections with the producers of the well-known and celebrated Nuremberg metalware. The weights were brought on board the KRONAN as regular medical objects to be used in composing medicinal remedies on board. It may well be that Alexander Stecker or Herman Fuchs brought a scale together with a cassette of medicinal weights on board as part of their personal belongings. A further medical artefact that was found at an earlier stage, located in the vicinity of the scruples, is a hemi-spherical wooden bowl used for gilding pills.[26] The latter, as well as the medicinal weights, manifest social and material superiority.

Even if we do not know who acted as the tradesman in supplying these medicinal weights, their discovery and identification, and the fact that they were to be used onboard the KRONAN, provide one explicit example that not only illustrates but confirms cultural

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exchange within the medicinal sphere between Nuremberg and Stockholm in the mid-1600s. Sweden not only adopted the medicinal weight system of Nuremberg, but the pharmacies in Stockholm also became a market for Nuremberg ware in the early modern period. As far as is known, these are the oldest weights of their kind that exist in Sweden.

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SHORT COMMUNICATION

Fatma Belkis Derman (1906-1958): The first female community pharmacist in Turkey

Halil Tekiner and Afife Mat

Abstract

After graduating from the Istanbul University School of Pharmacy in 1930, Fatma Belkis Derman (1906-1958) left her mark on the history of pharmacy as the first female pharmacist in Turkey to set up a pharmacy, operate a laboratory, and receive a license for a proprietary medicine in her own name. Despite various obstacles and even disdain amongst the locals of her time, she made women pharmacists visible and respectable in Turkey, paving the way for Turkish women to pursue pharmaceutical careers.

Introduction

The involvement of women in the pharmaceutical profession has a long but chequered history. From Saint Hildegard of Bingen, a twelfth-century Benedictine abbess and herbalist polymath, to Spanish pharmacist Dr Carmen Peña, the first female president of the International Pharmaceutical Federation (FIP) in 2014, we find pharmacy greatly indebted to women.[1, 2] Some of the pioneers are the first women to graduate from schools of pharmacy, such as Mary Corinna Putman (1842-1906) in the USA (1863) and Andréine Doumergue (1844-1877) in France (1874); as well as the first female presidents of pharmaceutical societies, such as Isabella Clarke-Keer (1843-1926) from the Association of Women Pharmacists (UK; 1905) and Jean Irvine (1877-1962) from the Royal Pharmaceutical Society of Great Britain (1947-1948).[3, 4, 5]

However, limited historical information remains in the literature addressing women's achievements in, or contributions to, pharmacy, particularly in non-Western countries. In order to contribute to bridging this gap, the current paper seeks to present the first comprehensive biography in English of Fatma Belkis Derman, the first female community pharmacist in Turkey, on the sixtieth anniversary of her death. The study was undertaken using primary reference sources obtained from her descendants, together with several other archival records and biographical sources.

The admission of Turkish women to health professions

Aside from the fields of midwifery and nursing, Turkish women's admission to the study of medicine began during the First World War (1914-1918), presumably due to lack of medical professionals, many of whom were serving at the Front.[6] Although the Şûra-yı Devlet (the Ottoman Council of State) had made a decision in 1898 that disallowed women from studying medicine, a small number of Turkish women went abroad to become physicians. An early example is Safiye Ali Hanım[7] (Krekeler; 1894-1952), who went to Germany in 1916 to study medicine at Würzburg University and returned to Turkey in 1922.[8]

The situation remained unchanged for nearly two decades until 1917, when the Sıhhiye Meclis-i Umûmisi (the General Board of Health) amended the previous ban, allowing women to study medicine in Turkey. Nonetheless, it was after enduring struggles that female students were given permission to register at the Tıp Fakültesi (the Faculty of Medicine) in 1921, which was put into effect a year later.[9] Similar attempts were also made in the field of dentistry; Ayşe Şâdiye Hanım (Güvendiren; 1904-??) and Hatice Azrâ Hanım (1897-??) became the first dentists to graduate in 1926. Additionally, the first female Turkish physicians graduated two years later.[10]

With regard to pharmacy, the situation was somewhat similar. During the Ottoman Empire, although formal pharmacy education was offered for the first time at the Mekteb-i Tıbbiye-i Adliye-i Şâhâne (the Imperial School of Medicine) in Istanbul in 1839, female students were allowed to enrol at the Eczacı Mektebi (the School of Pharmacy) only after 1922.[11] It was, however, only in September 1924 that Ayşe Saâdet Hanım became the first female student to enrol in the School of Pharmacy, although she quit after six weeks. Other students followed her in enrolling to the same school, but either failed classes because the courses were discontinued or transferred their registrations to other schools of the same university, mostly the Faculty of Medicine and the School of Dentistry. Among these was Fatma Belkis Hanım (Derman at marriage), who was in fact the fifteenth female student to register at the School of Pharmacy, but who would be one of the first to graduate.[12]

This flourishing of women's rights was in fact mostly due to the reforms implemented by the Young Republic, founded in 1923 under the leadership of Kemal Atatürk (1881-1938), that encouraged girls to receive education and to be actively involved in the community, giving special importance to women's rights (i.e. adoption of the Swiss Civil Code in 1926, voting rights in local elections in 1930, full universal suffrage in 1934, and the election of female deputies to the Turkish Parliament in 1935).[13]

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Figure 1. *Fatma Belkis Derman when she was a student at the School of Pharmacy in Istanbul, late 1920s. (Source: Courtesy of the Derman Family)*

Türkiye Cümhuriyeti
İSTANBUL DARÜLFÜNUNU
Tıp Fakültesi

Eczacılık Diploması

İstanbul Darülfünunu Tıp Fakültesine mevbut eczacı mektebi âlisinde tahsil etmiş ve nisamen muayyen imtihanları vermiş olan 1322 tarihinde İzmit de doğmuş Mustafakızı Fatma Belkıs Hafendiye Türkiye Cümhuriyeti içinde eczacılık yapmasına izin diploması verilmiştir. 31.7.930

Figure 2. *The pharmacy diploma of Fatma Belkis Derman, given by the Istanbul University Faculty of Medicine on 31 July 1930. (Source: Courtesy of the Istanbul University Faculty of Pharmacy)*

Figure 3. *Fatma Belkis Derman (first left) together with her two female classmates, Ayşe Semiha Erçin (second left) and Fatma Bedriye Siren (third left), at the School of Pharmacy in Istanbul, ca. 1930. (Source: Courtesy of the Derman Family)*

Biography of Fatma Belkis Derman

Fatma Belkis Derman was born in İzmit, Turkey, in 1906 to parents who had immigrated from Belgrade and Vidin.[14] Although she had initially aspired to become a teacher during her years at Erenköy Kız Lisesi, a respected high school for girls in Istanbul, and even had attended the related teaching courses, she changed her mind to pursue a career in pharmacy and registered to the Istanbul University School of Pharmacy (under the Faculty of Medicine) on 17 September 1927, with student number 294 (Figure 1).[15]

Completing her three-year studies there, and an internship at the Sırrı Enver Pharmacy in the Fatih district of Istanbul, she graduated in June 1930 (Figure 2). Thus she qualified as one of the first female pharmacists in the country, together with Ayşe Semiha Hanım (Erçin; 1907-??) and Fatma Bedriye Hanım (Siren; 1910-2007), two sisters, who would later become assistants at the departments of organic chemistry and biochemistry of the School of Pharmacy, respectively (Figure 3).[16, 17]

Because of Law No. 694 that mandated limiting the number of pharmacies in accordance with the population, allowing one pharmacy in a district per 10,000 inhabitants, Fatma Belkıs Hanım went to Adapazarı, a city where her family resided. She worked there for a short period of time as a commercial partner of pharmacist Ömer Bey's community pharmacy, before setting up her own Belkıs Eczâhânesi (the Belkıs Pharmacy) in Düzce in 1931. Thus she became the first female community pharmacist in Turkey.[18, 19]

In an interview she gave to Yeni Gün newspaper in 1931, Fatma Belkis Hanım stated that she was rather occupied with her pharmacy work. Although being much welcomed by the sole doctor of the district and local women there, some male villagers had doubts

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about her filling their prescriptions. She was even told of men standing outside of her pharmacy, waiting for the pharmacist instead of his presumed daughter. Fatma Belkis Hanım further stated that thanks to her strong commitment and keen observation skills, she was successfully able to integrate with local culture and become very familiar with the medical slang of the local patients, who called diseases and medications by different and mostly incomprehensible names.[20]

Interestingly, even several decades before the growth of patient-centred care in modern pharmacy practice, with remarkable foresight Fatma Belkis Hanım stated in the same interview that

> besides medications, I often give a lot of advice to my patients. I like my profession much more for being a confidant to most of them. Day by day, I better understand that comforting patients and their relatives, giving them hope, encouragement and empowerment, is of much more importance than solely giving medications.[21]

Fatma Belkis Hanım married Hasan Derman (1904-1971), a 1927 pharmacy graduate and later president of the Türkiye Eczacılar Cemiyeti (the Turkish Pharmaceutical Society), and she moved to Istanbul in 1932.[22] The following year, she took over the Ahmet Süreyya Pharmacy at no. 22 Ördeklibakkal Street in the Kumkapı district where she would operate until February 1939. She then ran the İstanbul Eczanesi (the Istanbul Pharmacy) at no. 33 Tramvay Street in the Bahçekapı district (jointly with pharmacist Kemal Atabey), after the owner of this pharmacy, pharmacist Agop Minasyan, died in August 1941 (Figure 4).[23]

Figure 4. *Stationary of Fatma Belkis Derman's İstanbul Eczanesi (the Istanbul Pharmacy) with its label including a pharmaceutical logo together with caduceus and the inscription of Belkis Derman's name, ca. 1941. (Source: Mert Sandalcı Collection)*

The proprietary medicines Derman produced in her pharmacy were Kinol, Vinokinyum and Comprimé Sulfaseptin, of which only the last one was patented in her name.[24, 25] Although she additionally became manager of the Istanbul Pharmaceutical Laboratory on 16 February 1944, she did not adapt well to this job and soon quit. Instead, she operated her ongoing Istanbul Pharmacy alone from 1947 until her final years. Suffering from chronic rheumatism and hypertension for many years, she died from heart disease on 26 July 1958.[26] Her pharmacy was then operated by her husband for three more years, until it was sold in 1961 to Leman Başkur-Kazuk (1918-2012), another pioneer female pharmacist.[27]

Fatma Belkis Derman was known by many of her colleagues as a candid, affectionate, vivid, cheerful and stylish person with high human and traditional values as well as an enthusiastic, meticulous, hard-working pharmacist and an ideal mother.[28, 29] She was for many years socially active with charities and local foundations, such as the Foundation of Women with Higher Education, the Foundation of the Graduates of the Erenköy High School for Girls, and the Soroptimist International, a worldwide volunteer service organization for business and professional women who work in particular to improve the lives of women and girls.[30]

In the obituary written after her death, Hasan Derman underlined the special place of her pharmacy in Fatma Belkis Derman's life with the following words:

> For Belkis, her pharmacy was always more than just a purpose and target; it was the greatest joy, a unique ambition and desire of her life until her last breath.[31]

Fatma Belkis Derman was laid to rest in the Zincirlikuyu Cemetery in Istanbul. She was survived by her only son, Mehmet Uğur Derman (1939-1994), who was a professor of oncology at the Cerrahpaşa Faculty of Medicine in Istanbul at the time he and his wife were killed in a road traffic accident.[32]

Derman's historical importance

Fatma Belkis Derman is a monumental figure in the history of Turkish pharmacy, paving the way for Turkish women to pursue pharmaceutical careers. Being a woman of strength and courage, she became the first female pharmacist in Turkey to set up a community pharmacy, operate a laboratory, receive a license for pharmaceutical products, and become a commercial partner of a drug warehouse, as well as a member of a pharmaceutical society. Despite various obstacles and even disdain among the locals of her time, she made women pharmacists visible and respectable in Turkey.[33]

Moreover, she served as a role model for later women pharmacists to rise in her country, together with many Middle Eastern countries. This should possibly include Najah al-Saati (1915-2016), who became the first female pharmacist in Syria, and presumably the

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Table 1. *The first female pharmacists in different fields of Turkish pharmacy (1924–2015)*[35-41]

Year	Achievement as the first	Name of female pharmacist	Graduation place	Year
1924	pharmacy student	Ayşe Saadet Hanım (?–?)	not graduated	-
1930	pharmacy graduate and community pharmacist	Fatma Belkıs Derman (1906–1958)	Istanbul Univ.	1930
1930	pharmacy graduate and teaching assistant	Fatma Bedriye Siren (1910–2007)	Istanbul Univ.	1930
1930	pharmacy graduate and teaching assistant	Ayşe Semiha Erçin (1907–?)	Istanbul Univ.	1930
1935	pharmacy graduate with the first rank	Semahat Hanım (?–?)	Istanbul Univ.	1935
1942	holder of doctorate degree in pharmacy	Hayriye Amâl (1912–2005)	Istanbul Univ.	1936
1942	director of a drug warehouse	Leman Kazuk Başkur (1918–2012)	Istanbul Univ.	1940
1943	owner of a pharmaceutical laboratory	Leman Kazuk Başkur (1918–2012)	Istanbul Univ.	1940
1944	associate professor	Hayriye Amâl (1912–2005)	Istanbul Univ.	1936
1950	full professor	Hayriye Amâl (1912–2005)	Istanbul Univ.	1936
1957	deputy member	Emine Piraye Levent (1915–1992)	Istanbul Univ.	1936
1959	director of pharmaceutical factory	Güzin Tamaç-Poffet (1926)	Univ. of Bern	1953
1969	dean of a Faculty of Pharmacy	Hayriye Amâl (1912–2005)	Istanbul Univ.	1936
1980	president of a pharmacy chamber	Nermin Usal (1929–2015)	AITIA EYO*	1975
1988	vice rector	Nuriye Aslı Özer (1942)	Ankara Univ.	1965
1991	minister of state	Güler İleri (1948)	AITIA EYO*	1974
1992	member of Académie nationale de pharmacie**	Afife Mat (1953)	Istanbul Univ.	1976
1999	recipient of the TÜBITAK*** service award	Asuman Baytop (1920–2015)	Istanbul Univ.	1943
2015	president of the EUFEPS****	Erem Bilensoy (1971)	Hacettepe Univ.	1992

* Ankara İktisadi ve Ticari İlimler Akademisi Eczacılık Yüksek Okulu (The Ankara Academy of Economics and Commercial Sciences School of Pharmacy), Ankara. ** The French National Academy of Pharmacy, Paris. *** The Scientific and Technological Research Council of Turkey, Ankara. **** The European Federation for Pharmaceutical Sciences, Stockholm.

whole Arabic world, after graduating from the Damascus Faculty of Medicine in 1949.[34]

Fatma Belkis Derman was also followed by many of her colleagues as the first females in different fields of pharmacy in Turkey, spanning from academia to the drug industry (Table 1).[35-41] Among them, Hayriye Amâl (1912-2005) is of great significance as the first female pharmacist to receive a PhD in pharmacy (1942), becoming a full professor (1950) and serving as dean of the Faculty of Pharmacy (1969-1970). Following in Fatma Belkis Derman's footsteps, the number of female pharmacists had reached 20,045 in Turkey in 2017 – constituting 56.4% of the 35,537 pharmacists in the country – indicating a slight but continuous increase in recent years.[42]

Conclusion

Fatma Belkis Derman deserves to be remembered with great admiration and respect for achieving a milestone in the history of Turkish pharmacy, and as a devoted woman of many firsts in her relatively short life. She will continue to serve as an inspiration for girls, not only in Turkey but also in other countries around the world, where they are deprived of the opportunity of an

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education – a fundamental human right that should never be relinquished.

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Disclosure statement

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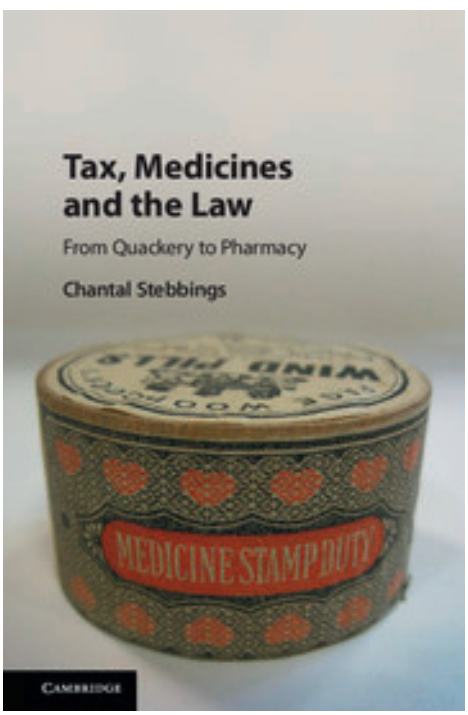
BOOK REVIEW

Tax, Medicine and the Law: From Quackery to Pharmacy

By Chantal Stebbings

Cambridge: Cambridge University Press, 2018. Pp. 240 + xv. Hardback, price £85.00. ISBN 978-1-107-02545-5. Online ISBN: 978-1-139-17899-0.

Reviewed by Stuart Anderson



Taxing medicines is potentially a quick and easy way for governments to raises revenue, and it remains a contentious issue. Medicine stamp duty was introduced in Great Britain in 1783 and was only abolished in 1941, some 158 years later. It was introduced as a source of revenue for the government, and was imposed on all so-called quack medicines, both patent and proprietary. This books traces the twists and turns of the tax and its implementation as it evolved over many decades.

The first Act, in 1783, imposed upon 'venders and sellers of medicines in Great Britain' the obligation to take out an annual licence. But three classes of seller were exempt from having a licence; those who had served an apprenticeship to a surgeon, apothecary, druggist or chemist; those who kept a shop only for the sale of drugs and medicines; and surgeons who had served in the navy or army. The medicines sold had to bear a stamp indicating that the duty had been paid.

Just two years later, in 1785, the entire Act was repealed only to be replaced by a new one. This imposed the same sort of obligations on sellers, but now exempted from duty certain classes of medicine. These included medicines specified in the First and Second Books of Rates – lists of import duties imposed on a wide range of natural drugs, including roots and barks, and chemicals such as alum and white lead. They also included 'entire drugs', i.e. those that were uncompounded and unmixed, and preparations sold by exempted persons, provided that 'the properties, qualities, virtues and efficacies' were 'known, admitted and approved' in the prevention or treatment of human ailments.

So began 150 years of legal wrangling about the meaning of 'known, admitted and approved' and other phrases in the legislation, the interpretation of which invariably fell to the revenue officers. In this book Chantal Stebbings traces the history of that wrangling, and in the process demonstrates the great benefit that fell to the chemists and druggists in being exempt from medicine stamp duty. Following the test case of Farmer vs Glyn-Jones in 1903, chemists and druggists were permitted to sell proprietary medicines free of duty (provided the formula was disclosed and that the process of disclosure was easy) thus giving them a substantial financial advantage over their competitors. One consequence of the ruling was a proliferation of books of pharmaceutical formulas, supplementing the *British Pharmacopoeia* and *British Pharmaceutical Codex*, amongst others.

In presenting her study Stebbings has two main aims; firstly, to illustrate broad themes that were of great importance to the development of tax law and the wider legal order; and secondly, to demonstrate that the duty, and the way it was administered, had a profound and unforeseen effect on the structures and practice of professional pharmacy. The tax, she argues, was a potent force in the development of the practice of pharmacy in Great Britain. She seeks to ensure that 'tax takes its place in the intellectual infrastructure of pharmaceutical history.' She hopes that it will 'provide new insights and fresh perspectives which might allow new connections to be made', and 'provide an accessible resource for scholars pursuing alternative discourses in the field of pharmaceutical history'. These are bold claims and deserve close scrutiny.

The contents of the book are divided into five chapters. Chapter 1 sets the scene by describing proprietary medicines and the fiscal state, exploring the nature of quackery, the taxation of proprietary medicines and the financial rationale for the tax. Chapter 2 explores the medicine stamp duty and the authority of law, covering enforcement issues, legislative drafting and revenue

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practice. Chapter 3 considers the tax and the profession of pharmacy, and explores the role of chemists and druggists in the legislation, professional reactions to the tax, and the impact of the tax concerning professionalism.

Chapter 4 investigates the relationship between the tax and the integrity of medicines. It explores the dangers of proprietary medicines, regulatory objectives and effects of the tax, perceptions of quality and safety of medicines, and the origins of the government laboratory. Finally, Chapter 5 narrates the demise of the tax, explores the abuse of revenue practice and the question of legality. Ultimately, the Pharmacy and Medicines Act of 1941 abolished medicine stamp duty and made it compulsory to disclose the names and quantities of active ingredients of all non-prescribed medicines for human use on the label or container. The chapter ends by considering whether the tax should be judged as a fiscal nonentity or as a revealing paradigm.

An entire book on an apparently minor tax might at first seem rather excessive. But Stebbings points out that 'an enduring tax on a specific commodity is rare in the history of taxation, especially one that remained essentially unreformed for the whole of its long life'. The book is therefore likely to be of considerable interest to historians of taxation. For pharmaceutical historians the most interesting chapter is likely to be that concerning the tax and the profession of pharmacy. Stebbings argues that medicine stamp duty had two positive effects on the occupational coherence of chemists and druggists: it conferred legislative recognition and legitimacy on the profession; and it acted as a catalyst for unity amongst a disparate occupational group.

However, she shows that the tax failed in its incidental regulatory purpose, and in reality had a negative effect, in that the stamp was perceived wrongly by users to be a guarantee of quality. It did however have a positive effect in encouraging disclosure of the formula. But ultimately Stebbings concludes that the most powerful effect of the medicine stamp duty on the pharmacy profession was a negative one. As a tax on a commodity, the tax increased the commercial character of chemists and druggists, and this proved the most potent obstacle to full professionalization. It reinforced the perception of chemists and druggists as traders rather than professionals, it focused attention on the product rather than the service, and it helped shape public perceptions of pharmacy that linger today.

The book is well-written and is logically structured and organised. The topic has been meticulously researched and the book is extensively and clearly referenced; there can hardly be a single source relating to the history of medicine stamp duty that has not made an appearance here. In accordance with the Cambridge University Press house style notes and references appear as footnotes rather than endnotes. This book will be an essential resource for historians wanting to learn more about the taxation of medicines and its impact on the profession of pharmacy.

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